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**Pink Bollworm Kill
with
Improved Gin Equipment** + [B]

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CONTENTS

	Page
Materials and Methods.....	1
Lint Cotton and Lint Cleaner Waste Studies...	2
Gin Trash Fan Tests.....	4
Results.....	5
Survival in Lint Cotton.....	5
Survival in Lint Cleaner Waste.....	5
Survival in Fan-Treated Trash.....	6
Summary.....	6

Pink Bollworm Kill with Improved Gin Equipment

3a 2 others
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Many larvae of the pink bollworm (*Pectinophora gossypiella* (Saunders)) remain in cotton bolls in the diapause or resting state and are carried to the gin in the harvested cotton. Robertson, Stedronsky, and Currie¹ reported investigations that revealed a high pink bollworm kill in the normal ginning operation. They found that adding cleaning and ginning machinery used in present-day modern gins resulted in a greatly increased kill over that caused by the simplest gin setup. They also found that fans of the kind commonly used for moving trash in the ginning operation killed all pink bollworms in the trash when installed and operated according to specifications set forth in their publication. Such fans were adopted for treating gin trash at the gin to fulfill quarantine requirements. Because of the continuous development of new ginning and cleaning machinery, and the addition of such equipment to the present-day gin, it is necessary periodically to reevaluate the pink bollworm kill during the ginning process to determine permissible changes for economy in cost of meeting quarantine requirements.

The investigations reported herein were conducted in March 1961 at the Southwestern Cotton Ginning Research Laboratory, and at a commercial gin—the Co-op Gin, both at Mesilla Park, N. Mex. The study was designed to provide information on: (1) Survival of pink bollworm larvae in lint cotton, (2) the effectiveness of basic-type lint cleaners in killing pink bollworms, and (3) effects of gin trash fan inlet-pipe arrangements on pink bollworm kill.

MATERIALS AND METHODS

Hand-picked and snapped pink bollworm-infested seed cotton was obtained from Torreon, Coahuila, Mexico. There was an average of 71.7 live pink bollworm larvae per pound in the hand-picked cotton, whereas samples of snapped cotton contained an average of 41.7 larvae per pound. Laboratory tests showed 6.4 percent foreign matter in the hand-picked cotton and 50.9 percent in the snapped cotton. The moisture contents of the respective cottons were 6.0 and 7.6 percent.

¹ ROBERTSON, O. T., STEDRONSKY, V. L., and CURRIE, D. H. KILL OF PINK BOLLWORM IN THE COTTON GIN AND THE OIL MILL. U.S. Dept. Agr. Prod. Res. Rpt. 26, 22 pp. 1959.

Lint Cotton and Lint Cleaner Waste Studies

In the study of pink bollworm survival in lint cotton and lint cleaner waste, three types of lint cleaners were used—bulk saw, unit saw, and pneumatic. A local commercial gin was used for studies of the pneumatic lint cleaner. All other tests with lint cleaners were conducted on conventional ginning machinery at the ginning research laboratory. The three types of lint cleaners were used in combination with overhead cleaning and ginning machinery. Eight different combination gin setups were used, as follows:

1. Green boll trap, separator, 24-shelf tower drier (no heat), 6-cylinder incline screen cleaner, separator, extractor feeder, 80-saw gin, and bulk saw-type lint cleaner, with lint cleaner 8-blade trash fan at 1,545 r.p.m., and a wheel diameter of 23 inches.
2. Same as No. 1, plus a bur machine and a 6-cylinder incline screen cleaner.
3. Same as No. 1, with lint cleaner trash fan at 1,795 r.p.m.
4. Same as No. 3, plus a bur machine and a 6-cylinder incline screen cleaner.
5. Green boll trap, separator, 24-shelf tower drier (no heat), 6-cylinder incline screen cleaner, separator, extractor feeder, 80-saw gin, and unit saw-type lint cleaner without lint cleaner trash fan.
6. Same as No. 5, plus a bur machine and a 6-cylinder incline screen cleaner.
7. Separator, 23-shelf tower drier (no heat), green boll trap, two 6-cylinder incline grid cleaners, extractor feeder, 88-saw gin, and pneumatic lint cleaner with lint cleaner trash fan at 1,980 r.p.m.
8. Same as No. 7, plus stick machine extractor and 6-cylinder incline grid cleaner.

Hand-picked cotton was ginned on setups 1, 3, and 5 at the ginning laboratory (fig. 1), and on setup 7 at the commercial gin (fig. 2). At the ginning laboratory, a total of 3,600 pounds of seed cotton was divided into nine equal ginning lots, which constituted three replicates for each lint-cleaner arrangement tested there. At the commercial gin, 1,790 pounds were ginned continuously and sampled periodically throughout the operation.

Snapped cotton was ginned on setups 2, 4, and 6 (fig. 3). A total of 4,500 pounds of snapped cotton was divided into nine equal ginning lots, and ginned in three replicates for each lint cleaner arrangement at the ginning laboratory. At the commercial gin, 1,860 pounds were ginned as one continuous lot, and sampled periodically for gin setup 8 (fig. 2).

Samples of lint and all the lint cleaner waste from both hand-picked and snapped cotton were collected for determining survival of larvae. Half of the cleaner waste from each lot of cotton was caught before it passed through a trash fan in tests with the bulk and pneumatic lint cleaners, and the remaining half was collected after it passed through the fan. In the test with the unit lint cleaner, all the waste was caught before it passed through the fan. In all cases where waste was col-

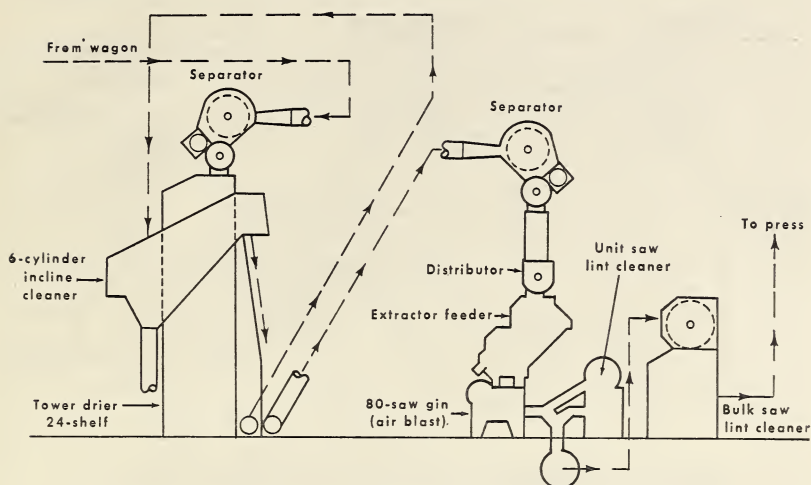


FIGURE 1.—Laboratory gin machinery, test setups 1, 3, and 5.

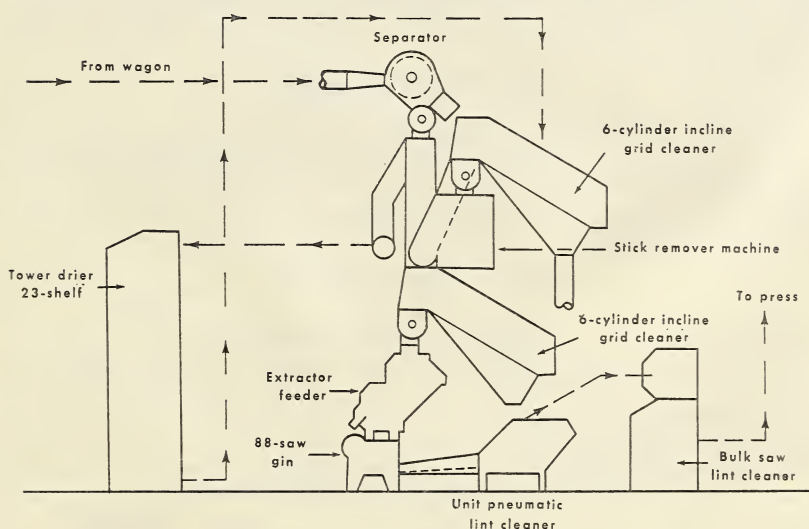


FIGURE 2.—Co-op gin machinery, test setups 7 and 8.

lected before it passed through the fan, a 2-pound sample from each lot was hand-examined and the remainder was placed in cages for moth emergence at the Entomology Research Laboratory, Brownsville, Tex. All the waste allowed to pass through the fan was also placed in cages for moth emergence.

Samples of lint were taken at short intervals during ginning to make a composite sample of 5 pounds per replicate. Two composite lint samples were taken from each lot at the laboratory—one before, and another after the lint passed through the cleaner. At the commercial

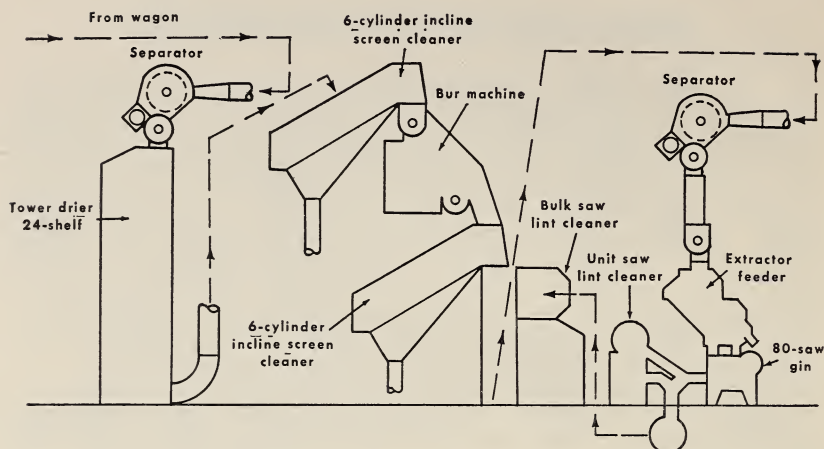


FIGURE 3.—Laboratory gin machinery, test setups 2, 4, and 6.

gin, lint samples were obtained only after the lint had passed through the cleaner. These samples were hand-examined for live pink bollworms.

Gin Trash Fan Tests

There were two fan setups used in studying the effects of inlet-pipe arrangement on pink bollworm kill. One of the setups was conducted at the ginning laboratory (fig. 4) where the trash was fed into the inlet piping by hand, and the other at the commercial gin where the trash went directly from the cleaning and ginning equipment to the fan.

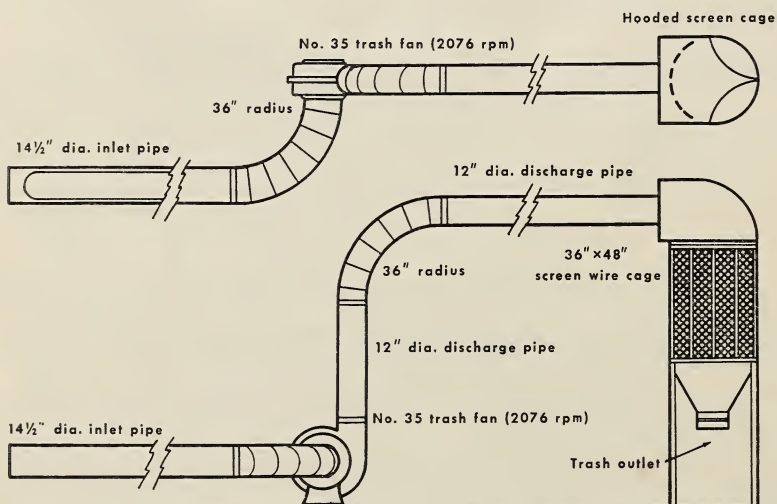


FIGURE 4.—Laboratory gin trash fan setup.

At the ginning laboratory, gin trash collected from overhead cleaning equipment was used. To determine the larval population in trash before it passed through the fan, all first-cleaner trash was examined by hand. Twenty-five pounds of trash from each of the other items of equipment were placed in outdoor cages at Brownsville, and the number of emerging moths noted. Live larvae found during hand-examination of the first-cleaner trash were reintroduced into the trash for the fan tests. In these tests the material was hand-fed into the fan inlet at rates simulating commercial operating conditions. The trash traveled approximately 10 feet through a 14½-inch-diameter pipe and around one 36-inch-radius, 14½-inch-diameter elbow into the fan housing. The elbow was fitted directly into the fan housing. There were no restrictions in the fan-inlet size. A fan having eight straight blades, with a wheel diameter of 23½ inches was operated in all test lots at 2,076 r.p.m. The treated trash was discharged through 6 feet of straight 12-inch-diameter pipe, and around one 24-inch-radius, 12-inch-diameter elbow into a large screen cage. Figure 4 shows trash-fan arrangement. All treated trash was placed in outdoor, moth-emergence cages at Brownsville, and the moths that emerged were counted.

About 300 pounds of composite gin trash was collected at the commercial gin after it passed through the fan, and was caged at Brownsville for moth emergence. The trash moved from the cleaning and ginning equipment through a 14-inch-diameter, straight pipe inlet into an eight-straight-blade fan. The fan had a diameter of 24½ inches and operated at 1,980 r.p.m. The trash discharged through a 14-inch-diameter outlet pipe.

RESULTS

Survival in Lint Cotton

Results of lint examinations are shown in table 1. The 90 pounds of lint collected before it passed through the lint cleaner contained five live pink bollworms—all from the hand-picked cotton—of which only one survived the period for adult emergence. No live worms were found in 100 pounds of lint examined after it passed through the cleaners. This 100 pounds of lint represented seed cotton that contained an estimated 28,000 live worms before ginning.

Survival in Lint Cleaner Waste

The lint cleaner waste from 3,940 pounds of snapped cotton and 3,295 pounds of hand-picked cotton was used to determine larval mortality occurring before the waste reached the trash fan. Hand-examination of a total of 40 pounds of this waste showed no live larvae (table 2). The remainder, caged for moth emergence, yielded only one moth, which was in waste from the pneumatic lint cleaner. In fan-treated waste from 2,095 pounds of hand-picked cotton and 2,440 pounds of snapped cotton, there was no survival.

TABLE 1.—*Pink bollworm survival in lint before and after passing through the lint cleaner*

Gin setup ¹	Type of lint cleaner	Before cleaner			After cleaner		
		Lint	Larvae		Lint	Larvae	
			Dead	Alive ²		Dead	Alive
HAND-PICKED COTTON							
		<i>Pounds</i>	<i>Number</i>	<i>Number</i>	<i>Pounds</i>	<i>Number</i>	<i>Number</i>
1-----	Bulk saw-----	15	41	3	15	45	0
3-----	Bulk saw-----	15	95	1	15	75	0
5-----	Unit saw-----	15	39	1	15	30	0
7-----	Pneumatic-----	0	-----	-----	5	8	0
SNAPPED COTTON							
2-----	Bulk saw-----	15	1	0	15	7	0
4-----	Bulk saw-----	15	7	0	15	5	0
6-----	Unit saw-----	15	18	0	15	5	0
8-----	Pneumatic-----	0	-----	-----	5	2	0

¹ See gin setup description in text, pp. 2, 3, and 4.² Of the larvae found alive at time of examination, only one survived.

Survival in Fan-Treated Trash

There was no pink bollworm survival in the fan-treated trash except that from the bur machine (table 3). The fan speed was 2,076 r.p.m. Robertson, Stedronsky, and Currie (ibid.) reported no pink bollworm survival when the speed of this size fan was 2,250 r.p.m., or greater.

Results of these trash fan tests substantiated previous tests reported by Currie.² The data in Currie's report showed that the pipes leading to the trash fans of 26 gins where tests were run had diameters larger than the size specified to meet Federal quarantine requirements (Robertson, Stedronsky, and Currie, ibid.); yet 100-percent kill was obtained when the fans were operated at the required speed.

SUMMARY

Experiments were conducted to determine the survival of pink bollworm larvae in lint cotton and lint cleaner waste, and the effect of arrangements of trash fan inlet piping on pink bollworm kill. When heavily infested seed cotton was run through the machinery commonly used in ginning cotton, nearly all larvae were killed or

² Currie, D. H. Unpublished report.

TABLE 2.—*Pink bollworm survival in lint cleaner waste before and after fan treatment*

Gin setup ¹	Type of lint cleaner	Estimated larvae in seed cotton ginned	Insects found in waste ²			
			Before fan		After fan	
			Larvae		Moths that emerged	Moths that emerged
			Dead	Alive		
HAND-PICKED COTTON						
		<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
1-----	Bulk saw-----	86, 004	48	0	0	0
3-----	Bulk saw-----	86, 004	4	0	0	0
5 ² -----	Unit saw-----	86, 004	137	0	0	-----
7-----	Pneumatic-----	129, 289	108	0	1	0
SNAPPED COTTON						
2-----	Bulk saw-----	70, 005	52	0	0	0
4-----	Bulk saw-----	70, 005	22	0	0	0
6 ³ -----	Unit saw-----	70, 005	18	0	0	-----
8-----	Pneumatic-----	86, 806	47	0	0	0

¹ See gin setup descriptions in text, pp. 2, 3, and 4.² Half of waste from each gin setup received fan treatment and other half was untreated.³ All waste collected before fan.TABLE 3.—*Pink bollworm survival from single fan treatment of gin trash*

Kind of trash	Before fan		After fan	
	Trash	Moths or larvae	Trash	Moths ¹
GINNING LABORATORY SETUP				
	<i>Pounds</i>	<i>Number</i>	<i>Pounds</i>	<i>Number</i>
First cleaner-----	356	² 13, 110	356	0
Second cleaner-----	25	¹ 145	50	0
Bur machine-----	25	¹ 50	200	3
Extractor feeder, huller and gin-----	25	¹ 91	200	0
COMMERCIAL GIN SETUP				
Composite-----	None	-----	300	0

¹ Moths from caged trash.² Live larvae in trash examined.

removed from the lint by the time it reached the lint cleaner. Results of experiments showed that all larvae passing through the saw types of lint cleaners were killed but there was some survival when the pneumatic lint cleaner was used.

Tests were made with gin trash fed into a 23-inch trash fan. The use of a 14½-inch inlet pipe with a 90° elbow connected directly to the fan housing gave mortality similar to that in tests reported by Robertson, Stedronsky, and Currie (*ibid.*), in which the inlet pipe was 11 inches in diameter with at least 58 inches of straight pipe between any elbow and the fan housing.